



## Quantifying the influence of local meteorology on air quality using generalized additive models

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**Year:** 2011  
**Journal:** Atmospheric Environment. 45 (6): 1328-1336

### Abstract:

Recent acknowledgement of the sensitivity of air quality to changes in climate has initiated a closer examination of the relationships between meteorology and air quality. This paper presents the estimated response of daily air pollutant concentrations in Melbourne, Australia to local-scale meteorology. The meteorological-pollutant relationships have been assessed after controlling for long-term trends, seasonality, weekly emissions, spatial variation, and temporal persistence using the framework of generalized additive models (GAMs). Overall, results found that the aggregate impact of meteorological variables in the models explained 26.3% of the variance in O<sub>3</sub>, 21.1% in PM<sub>10</sub>, and 26.7% in NO<sub>2</sub>. This indicates that meteorology - at the local-scale, is a relatively strong driver of air quality in Melbourne. Analysis of partial residuals plots found that changes in temperature, particularly when above 35 degrees C, resulted in the strongest positive response for O<sub>3</sub> (150%), PM<sub>10</sub> (150%) and NO<sub>2</sub> (120%). Other variables (boundary layer height, winds, water vapor pressure, radiation, precipitation, and mean sea-level pressure) displayed some importance for one or more of the pollutants, but their impact in the models was less pronounced. In sum, we provide results that form a solid foundation for understanding the importance of local-scale meteorology as a driver of regional air pollution. Additionally, these results can be used to provide a window into how changes in climate may affect air quality. (C) 2010 Elsevier Ltd. All rights reserved.

**Source:** <http://dx.doi.org/10.1016/j.atmosenv.2010.11.051>

### Resource Description

#### Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Meteorological Factors, Meteorological Factors, Meteorological Factors, Precipitation, Temperature

**Air Pollution:** Interaction with Temperature, Ozone, Particulate Matter, Other Air Pollution

**Air Pollution (other):** NO<sub>2</sub>

**Temperature:** Fluctuations

#### Geographic Feature:

resource focuses on specific type of geography

# Climate Change and Human Health Literature Portal

Urban

## **Geographic Location:**

resource focuses on specific location

Non-United States

**Non-United States:** Australasia

## **Health Impact:**

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

## **Resource Type:**

format or standard characteristic of resource

Research Article

## **Timescale:**

time period studied

Time Scale Unspecified